

WHAT IS CLAIMED IS:

1. An apparatus for ejecting droplets comprising:

a passage unit formed therein with plural nozzles  
5 through which droplets are ejected and pressure chambers  
each connected to a corresponding nozzle; and

an actuator unit that applies an ejection energy to  
liquid in the pressure chambers, in which a piezoelectric  
sheet is sandwiched between electrodes to thereby form  
10 plural active portions, the actuator unit being bonded to  
the passage unit such that each of the active portions may  
face the pressure chambers,

wherein, at an operating temperature, the actuator  
unit receives stress of -40 MPa to 10 MPa in a direction  
15 substantially parallel to a face thereof bonded to the  
passage unit.

2. The apparatus according to claim 1, wherein the  
bonded face of the actuator unit to the passage unit has a  
20 rectangular shape, and wherein the stress acts in a  
direction along a longitudinal direction of the actuator  
unit.

3. The apparatus according to claim 1, wherein the  
25 passage unit has a first plate formed therein with the

pressure chambers, a second plate formed therein with a liquid containing chamber that contains liquid provided to the pressure chambers, and a third plate formed therein with the nozzles, and wherein the actuator unit is bonded  
5 on the first plate.

4. The apparatus according to claim 3, in the passage unit, wherein the second plate is sandwiched between the first plate and the third plate, and wherein  
10 each of the pressure chambers communicates with a corresponding nozzle at one end thereof and with the liquid containing chamber at the other end thereof.

5. The apparatus according to claim 1, wherein a  
15 difference in linear expansion coefficient between the passage unit and the actuator unit is more than -7 parts per million (ppm) and below 24 parts per million(ppm) .

6. The apparatus according to claim 5, wherein the  
20 passage unit and the actuator unit are bonded to each other with a thermosetting adhesive that has a curing temperature of 30 °C to 200 °C.

7. The apparatus according to claim 6, wherein the  
25 thermosetting adhesive is an epoxy-based material.

8. A method for manufacturing an apparatus for ejecting droplets, comprising the steps of:

5 forming a passage unit formed therein with plural nozzles through which droplets are ejected and pressure chambers each connected to a corresponding nozzle;

10 forming an actuator unit that applies an ejection energy to liquid in the pressure chambers, in which a piezoelectric sheet is sandwiched between electrodes to thereby form plural active portions;

15 overlapping the actuator unit and the passage unit with each other with a thermosetting adhesive having a predetermined curing temperature and being interposed therebetween such that each of the active portions may face the pressure chamber;

heating the passage unit and the actuator unit overlapped with each other with the thermosetting adhesive being interposed therebetween up to the predetermined curing temperature of the thermosetting adhesive; and

20 leaving the passage unit and the actuator unit until cooling down to the operating temperature after the thermosetting adhesive has cured such that the actuator unit may receive stress of -40 MPa to 10 MPa in a direction substantially parallel to a face thereof bonded to the 25 passage unit.

9. The method according to claim 8, wherein the piezoelectric sheet is shaped into rectangle in the step of forming the actuator unit, wherein the rectangular face of 5 the piezoelectric sheet faces the passage unit in the step of overlapping, and wherein the stress acts in a direction along a longitudinal direction of the bonded face of the piezoelectric sheet in the step of leaving.

10 10. The method according to claim 8, wherein, in the step of forming the passage unit, the passage unit is formed by laminating a first plate formed therein with the pressure chambers, a second plate formed therein with a liquid containing chamber that contains liquid provided to 15 the pressure chambers, and a third plates formed therein with the nozzles,

and wherein, in the step of overlapping, the first plate faces the actuator unit.

20 11. The method according to claim 8, wherein, in the overlapping step, the thermosetting adhesive having the predetermined curing temperature is determined based on a difference in linear expansion coefficient between the passage unit and the actuator unit.

12. The method according to claim 11, wherein a difference in linear expansion coefficient between the passage unit and the actuator unit is more than -7 parts per million (ppm) and below 24 parts per million(ppm).

5

13. The method according to claim 12, wherein the predetermined curing temperature of the thermosetting adhesive is 30 °C to 200 °C.

10 14. The method according to claim 13, wherein the thermosetting adhesive is an epoxy-based material.